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BOOK REVIEWS

Strike-Slip Deformation, Basin Formation, and Sedimentation. Edited by K.T. Biddle & N. Christie-Blick. Society of Economic Paleontologists and Mineralogists, Tulsa, Oklahoma, Special Publication No. 37, 1985, 386 pages. $31.00 U.S., SEPM/AAPG members.

The S.E.P.M. series of special publications generally offers high-quality, up-to-date papers, covering a wide variety of topics that are useful to geology students and specialists alike. This volume is no exception. The editors' intention to augment a similar publication (IAS Special Publication No. 4), published five years earlier, has succeeded admirably. Interest in strike-slip settings has increased exponentially in little more than a decade since Crowell's 1974 paper on the southern California basins. Concomitantly there has been increased recognition of problems inherent in reconstructing the geological history of strike-slip terranes, and the diversity of tectonosedimentary regimes. For example, reconstruction of sedimentary facies in any particular basin is linked in a fundamental way to detailed studies of the deformation history. The diversity of sedimentary and structural styles in strike-slip basins that range in age from Precambrian to Recent is reflected in the papers making up this volume. None of the examples presented here duplicates those discussed in the IAS volume.

The book is divided into four parts. Part one, an Overview, consists of five papers that deal with general aspects of structural style and kinematics, basin subsidence, thermal and depositional histories. An introductory paper by Christie-Blick & Biddle provides an informative summary of many of these aspects, although in places it is difficult to read because of a plethora of references.

In the second part, six papers describe basins contained in what are broadly defined as Extensional Settings. These include basins formed in areas of regional extension such as rift margins, for example the Dead Sea Rift and the Piaui Basin adjacent to northern Brazil, and transtensional regimes (pull-apart, releasing bends) such as the San Andreas fault system, and strike-slip basins in northern Spain and the Canadian Shield.

Strike-slip basins formed in Contractional Settings are the subject of the third section of eight papers. These contributions emphasize the fact that small basins of extensional or pull-apart origin are not uncommon in regions of plate convergence, either at subduction zones or transgressive transform-boundaries. Examples include basins formed in close proximity to thrust belts, as in Vienna Basin (Alpine–Carpathian thrust belt) and Spitzbergen, pericollisional basins of the Canadian Cordillera, basins associated with an oblique-slip plate boundary in the Canadian Arctic, and deformation at strike-slip restraining bends in Jamaica.

The final section is a useful glossary of terms used throughout the book.

What is immediately apparent upon reading this set of papers is the structural and sedimentological complexity of strike-slip regimes. This book provides an excellent example of the kind of integrated approach to research that is required to understand such complexities, and should be a welcome addition to any earth science library.

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Roles of Organic Matter in Sediment Diagenesis. Edited by Donald L. Gautier. Society of Economic Paleontologists and Mineralogists, Special Publication No. 38, Tulsa, Oklahoma, 1986. 203 pages, $30.00 (U.S.) to SEPM/AAPG members; $38.00 to nonmembers.

This volume is a collection of 16 papers presented at the SEPM mid-year meeting in 1984. The papers represent a reasonable summary of research in diagenesis to that date and provide a comprehensive follow-up to SEPM Special Publication 36, "Aspects of Diagenesis". The organic chemist or geochemist may find the title misleading, as there is more information about the inorganic part of the system. Comparison with the papers in "Aspects of Diagenesis" shows that considerable progress has been made in attempting to incorporate the organic part of the system into inorganic diagenetic studies.

A trio of papers (by Walker, Kocurko, and Curtis & Coleman) bring the reader the latest data relevant to the early diagenesis of carbonates and carbonate cements in clastic rocks. The group from Laramie, Wyoming (Surdam and coworkers) have three papers that reflect their recent research. Pyrolysis experiments and kerogen analysis are combined with data on illite/smectite mixtures. A field study relates clay-mineral reactions to the organic reactions and interprets a relationship between clay dissolution and generation of organic acids. A third theoretical study interprets dissolution of silicates in terms of oxidation of organic matter by mineral oxidants and complexation of aluminum (and thus enhanced silicate solubility) by organic species.

Two papers, by Lundegard & Land and Kharaka *et al.*, demonstrate that the organic and inorganic systems interact *via* the aqueous phase. Lundegard & Land present a detailed account of the role of CO_2 in diagenesis in the Gulf Coast and evaluate a

number of CO_2 sources, including decarboxylation of organic matter. Kharaka and coworkers summarize and update their data on the content of organic matter in sedimentary pore-waters and show how these species may influence water chemistry.

The paper by Taguchi *et al.* represents a *tour de force* in the application of analytical techniques. The data reported are almost as overwhelming as the number of authors (8). The remaining papers cover fission-track applications to thermal histories (Naeser), a multipronged field-study using fluid inclusions, clay mineralogy and vitrinite reflectance (Pollastro & Barker), a field study of the Brent Sandstone (Bjorlykke & Brendsdal), a fluid-inclusion, stable isotope and vitrinite-reflectance study in the Guadalupe Mountains (Barker & Halley), a catalogue of possible reactions involving organic acids, carbonic acid and mineral species (Meshri). Wood & Hewett round out the volume with sophisticated mathematical models of fluid flow coupled to thermal mass-transfer.

Overall, this volume is good value for the money. The price of compilations like this seems to climb (what doesn't?), and thus they seem less of a bargain than before. The book does provide an outstanding starting-point for researchers coming into the field and a guide book for graduate courses on diagenesis. The quality of production is good. Most of the work here shows the study of diagenesis to be healthy and progressing rapidly. New concepts are not lacking, but there is certainly not a clear consensus on the manifold problems that the study of diagenesis presents. I recommend the book for those interested in an overview of recent research in chemical aspects of diagenesis.

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Thermodynamic Relations in Open Systems. By George Tunell. Carnegie Institution of Washington Publication 408A, 1977, 69 pages. *Condensed Collections of Thermodynamic Formulas for One Component and Binary Systems of Unit and Variable Mass.* By George Tunell. Carnegie Institution of Washington Publication 408B, 1985, 294 pages, $15.00 (U.S.).

Classical thermodynamics forms a closed body of knowledge, theoretically complete. However, as any practitioner knows, conceptual and theoretical errors abound in many textbooks on the subject. These two small books correct one of the most persistent errors, introduced, ironically enough, in an obituary for J. Willard Gibbs. In 1905 Sir Joseph Larmor wrote, incorrectly, that for an open system $dS = dq/T$, where dq is the quantity of heat received by the system, T the absolute temperature and dS the change in entropy of the system. This error propagated widely, as described by Tunell, and resulted in the wide dissemination of incorrect thermodynamic formulae. Although the correct formula, $dS = dq/T + \Sigma\, m_i \cdot s_i$, where m_i is the mass of component i and s_i the entropy per unit mass of species i, was published more than 50 years ago, some prestigious texts continue to carry the erroneous formulation. Tunell gives both corrected formulae, and the reasoning and mathematical apparatus necessary to derive them. A feature of the derivation is the use of a minimum number of variables, which leads to some results of unusual appearance. For example, formulae involving two components are not symmetrical in the two components. However, such formulations are to be welcomed, since classical thermodynamics has never been properly reduced to axiomatic form. Tunell's results are of more than theoretical interest, since study of open systems is now much in vogue in connection with ore deposits and metasomatism. One hopes that such collections will prevent further use of incorrect formulae. Tunell points out that the error treated by him may be connected with a view of heat as something that can be transferred isothermally from one body to another, rather than the (correct) view of heat as energy transferred from one body to another owing to a temperature difference. A similar confusion, explicitly pointed out in the text, surrounds the definition of work in an open system. Tunell makes it clear that a suitable operational analysis and mathematical apparatus avoid all difficulties with these definitions. In this connection, it is interesting that thermodynamics texts quoted approvingly in this work tend to be engineering texts, whereas texts on theoretical and chemical thermodynamics tend to fare badly.

These thin volumes make no pretence of being textbooks, and make no attempt to systematically develop classical thermodynamics in a systematic manner. However, they are a model of thermodynamic reasoning, completely general, yet carefully tied to experimental methods. The mathematical methods involving Jacobians are fully explained, and a necessary theorem proved. Tunell makes no concessions for the sake of ease of style or presentation, but there is nothing here that cannot be easily grasped by anyone familiar with advanced calculus. These volumes will be of interest to anyone with a serious interest in thermodynamics, not only as a source of carefully checked formulae, but also as an inspiration to concise, rigorous presentation.

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The Magic of Minerals. By Olaf Medenbach and Harry Wilk. Springer-Verlag, New York, 1986. 204 pages, $45.00 U.S.

It's not often that mineralogists have the chance to impress their nongeological friends with the fascination of minerals and their myriad crystal-forms. This coffee-table-sized book provides a device to get the attention of both those who abhor geology and those who practice its arcane ways.

The book is not just a collection of pretty faces. There is an elementary discourse on the nature of crystalline substances and a description of the physical properties we have all learned (more or less) to use in identification. (Remember the alternate tasting and acid dousing that accompanied most of our early efforts?).

The basic structural groups of the silicate minerals are described in enough detail to suffice in first-year geology but all this is just icing. This is a book about which, with an absolutely clear conscience, you can say "I only look at the pictures". The photographs and the quality of their printing are stunning. There are 110 color photographs, and each one is an experience. The mineral specimens are works of art in their own right; whereas nearly every mineral covered in introductory mineralogy is here, the chances of ever seeing specimens like these outside a museum are remote. The book could still serve as an inspiration to that person in his or her first mineralogy course, who is suddenly overwhelmed by the sheer mass of different names of minerals. If nothing else, it can provide the student with an interlude from $2/m\ 2/m\ 2/m$; alpha, beta, gamma; *a,b,c,* (or *X,Y,Z*); {1011} and the biaxial indicatrix.

This book is not cheap, but if you know someone who needs their mineral fix or have a collector friend (and a bank account with a margin for expenditure), it is outstanding value. If you're stuck for a gift for a lattice-oriented friend, this would do the trick.

The description that accompanies each photograph is a wonderful combination of the historical origins of the mineral name, its uses and a physical description. A treasure house of information is stored in readable form on each page. I can highly recommend this book for experienced geologists who love minerals and as an inspiration to novices in the field.

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The Stillwater Complex, Montana: Geology and Guide. G.K. Czamanske and M.L. Zientek, technical editors. Montana Bureau of Mines and Geology (Main Hall, Montana College of Mineral Science and Technology, Butte, Montana 59701), 1985, Special Publication 92, 396 p., 4 geological maps. Price: US $28.00 (softbound).

This book on the Stillwater Complex, Montana, is an up-to-date synthesis of Stillwater geology. It was prepared, in part, as a detailed guide for field-trip participants in Project 161 of the IGCP on sulfide deposits in mafic and ultramafic rocks, as well as those from the fourth Platinum Symposium, 1985. The result is an excellent combination of observation, description, direction, clarification, hypotheses and bibliography, prepared by many authors from surveys, universities and industries, with a strong guiding hand from the USGS.

The volume consists of 28 chapters, plus an extensive bibliography (15 pages), other references and four uncolored geological maps. Unfortunately, there is no single map of the complex as a whole. The chapters are of uneven length and quality, a result of the multiauthor approach. In general, the first half of the book provides the geological framework of the Complex, including a very necessary chapter that pulls together the many stratigraphic approaches and varied terminology that have been used in the Stillwater literature; the second half deals with detailed directions to, and descriptions of, outstanding exposures. The chapters are richly illustrated with photographs (many of them quite delightful historical and hysterical mementos of Stillwater history), as well as pen sketches. Especially valuable to the field tripper will be the panoramic photos with superimposed geological contacts.

The standards in the book (such as presentation, editing, style, paper) are very high, although some groups of photographs have very low contrast. Some of the many maps are reduced to such a scale that a hand lens is necessary for careful appreciation; on the whole, however, the diagrams and figures are very good. This book is meant to be taken to the field and used in self-guided study of the Stillwater Complex; because of the very poor binding, however, it will certainly not last beyond the second or third stop. Binding it with a hard cover will make it an excellent purchase for field trips to the Complex, or in the lecture room and laboratory.

The value of this book will mainly be apparent on field trips, but it is also useful in senior and graduate-level courses that deal with layered intrusions and their metallogeny. The volume does contain a wealth of information that has not been published, as well as vast quantities of good descriptive material that can be put to good use in trying to sort through some of the published genetic models of such enigmatic processes as crystallization of the Stillwater magmas, magma mixing, chromite and platinum-group-element concentration.

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Quantitative Data File for Ore Minerals (second edition). By A.J. Criddle and C.J. Stanley. British Museum (Natural History), London, 1986, 420 pages. £95.00.

The second edition, which contains twice as much information as the original 1977 edition, has data for 328 mineral species and 92 mineral varieties. All the common minerals are included, as well as many of the less common and rare species. Three keys (COM wavelength, color values, and reflectance data in air and oil, 440–700 nm) are provided for mineral identification.

This data file makes possible the routine identification of ore minerals by the microscope-photometer. The quality of presentation is excellent, with the data in black type easy to read on the format card in blue type. The nomenclature of minerals should have followed I.M.A. rules at all times.

This book is essential for all libraries and ore microscopists.

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